



**THERMISTORS (THERMALLY SENSITIVE RESISTORS), NTC
RANGE 2000 TO 100000 OHMS AT +25°C
OVER THE TEMPERATURE RANGE OF -60°C TO +160°C**

**BASED ON TYPE G2K7D411, G4K7D421, G10K4D451,
G10K4D453, G15K4D489, G15K4D589, G100K6D487**

ESCC Detail Specification No. 4006/014

Issue 11	April 2025
----------	------------



LEGAL DISCLAIMER AND COPYRIGHT

European Space Agency, Copyright © 2025. All rights reserved.

The European Space Agency disclaims any liability or responsibility, to any person or entity, with respect to any loss or damage caused, or alleged to be caused, directly or indirectly by the use and application of this ESCC publication.

This publication, without the prior permission of the European Space Agency and provided that it is not used for a commercial purpose, may be:

- copied in whole, in any medium, without alteration or modification.
- copied in part, in any medium, provided that the ESCC document identification, comprising the ESCC symbol, document number and document issue, is removed.

DOCUMENTATION CHANGE NOTICE

(Refer to <https://escies.org> for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
1720	Specification upissued to incorporate changes per DCR

TABLE OF CONTENTS

1	GENERAL	5
1.1	SCOPE	5
1.2	APPLICABLE DOCUMENTS	5
1.3	TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS	5
1.4	THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS	5
1.4.1	The ESCC Component Number	5
1.4.2	Component Type Variants and Range of Components	6
1.5	MAXIMUM RATINGS	7
1.6	PHYSICAL DIMENSIONS	8
1.7	FUNCTIONAL DIAGRAM	8
1.8	MATERIALS AND FINISHES	9
1.8.1	Body	9
1.8.2	Lead Material	9
2	REQUIREMENTS	9
2.1	GENERAL	9
2.1.1	Deviations from the Generic Specification	9
2.1.1.1	Deviations from Qualification and Periodic Tests - Chart F4	9
2.2	MARKING	9
2.3	THERMAL SHOCK	9
2.4	TERMINAL STRENGTH	9
2.5	ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES	10
2.5.1	Room Temperature Electrical Measurements	10
2.5.2	High and Low Temperatures Electrical Measurements	10
2.6	PARAMETER DRIFT VALUES	11
2.7	INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS	11
2.8	BURN-IN CONDITIONS	12
2.9	OPERATING LIFE CONDITIONS	12
	APPENDIX A	13

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [4006](#), Thermistors (Thermally Sensitive Resistors).
- (b) ESCC Detail Specification No. [3901/001](#), Polyimide Insulated Wires and Cables, Low Frequency, 600V, -100 to +200°C.
- (c) ESCC Detail Specification No. [3901/012](#), Extruded, Crosslinked Fluoropolymer Insulated Wires on Silver Plated Copper Conductor, Low Frequency, 600V, -100 to +200°C.

1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply. In addition, the following symbols are used:

NTC = Negative Temperature Coefficient.

1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

Example: 400601408

- Detail Specification Reference: 4006014
- Component Type Variant Number: 08 (as required)

1.4.2 Component Type Variants and Range of Components

The component type variants and range of components applicable to this specification are as follows:

Variant Number	Based on Type	Resistance/Temperature Characteristics (Notes 1, 2)											
			-60°C	-40°C	-20°C	0°C	+25°C	+50°C	+70°C	+100°C	+125°C	+140°C	+160°C
08	G15K4D489	RZ (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250	659.8	465.50	302.40
		Tol. (±%)	10	6.3	3.35	1	1.01	1.03	1.05	1.01	2	3	4
09	G10K4D453	RZ (Ω)	847284	239768	78930	29490	10000	3893	1990	817.2	426.0	298.12	191.77
		Tol. (±%)	7	3	2.6	2	2	1.7	1.6	3	3.5	4	4
10	G2K7D411	RZ (Ω)	-	43362	14658	5650	2000.0	815.0	432.0	187.40	102.00	-	-
		Tol. (±%)	-	2.9	2.54	1.57	1.34	1.17	1.05	1.5	2.5	-	-
11	G4K7D421	RZ (Ω)	-	86724	29316	11300	4000	1630.0	864.0	374.80	204.00	-	-
		Tol. (±%)	-	2.9	2.54	1.57	1.34	1.17	1.05	1.5	2.5	-	-
12	G100K6D487	RZ (Ω)	-	-	-	-	100000	-	-	5574	2642.4	1756.3	1059.0
		Tol. (±%)	-	-	-	-	1.75	-	-	1.11	1.41	1.32	1.21
13	G15K4D589	RZ (Ω)	1342000	371300	120100	44420	15000	5855	3009.0	1250	659.8	465.50	302.40
		Tol. (±%)	10	6.3	3.35	1	1.01	1.03	1.05	1.01	2	3	4
14	G10K4D451	RZ (Ω)	847284	239768	78930	29490	10000	3893	1990	817.2	426.0	298.12	191.77
		Tol. (±%)	6	3	1.3	0.93	0.8	0.8	0.79	1.5	2.5	3	3

Variant Number	Based on Type	Lead Material	Weight max (g)
08	G15K4D489	Note 3	2.3
09	G10K4D453	Note 3	4
10	G2K7D411	Note 3	4
11	G4K7D421	Note 3	4
12	G100K6D487	Note 3	4
13	G15K4D589	Note 4	2.3
14	G10K4D451	Note 3	4

NOTES:

- For test purposes, when zero power is dissipated and the ambient temperature is held as specified, the value is referred to as R_z (Zero Power Resistance).
- The reference resistance is specified at +25°C.
- The lead material shall be 26 AWG fluoropolymer insulated wire with ESCC Component Number [390101203B](#) in accordance with ESCC Detail Specification No. [3901/012](#).
- The lead material shall be 26 AWG polyimide insulated wire with ESCC Component Number [390100124B](#) in accordance with ESCC Detail Specification No. [3901/001](#).

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

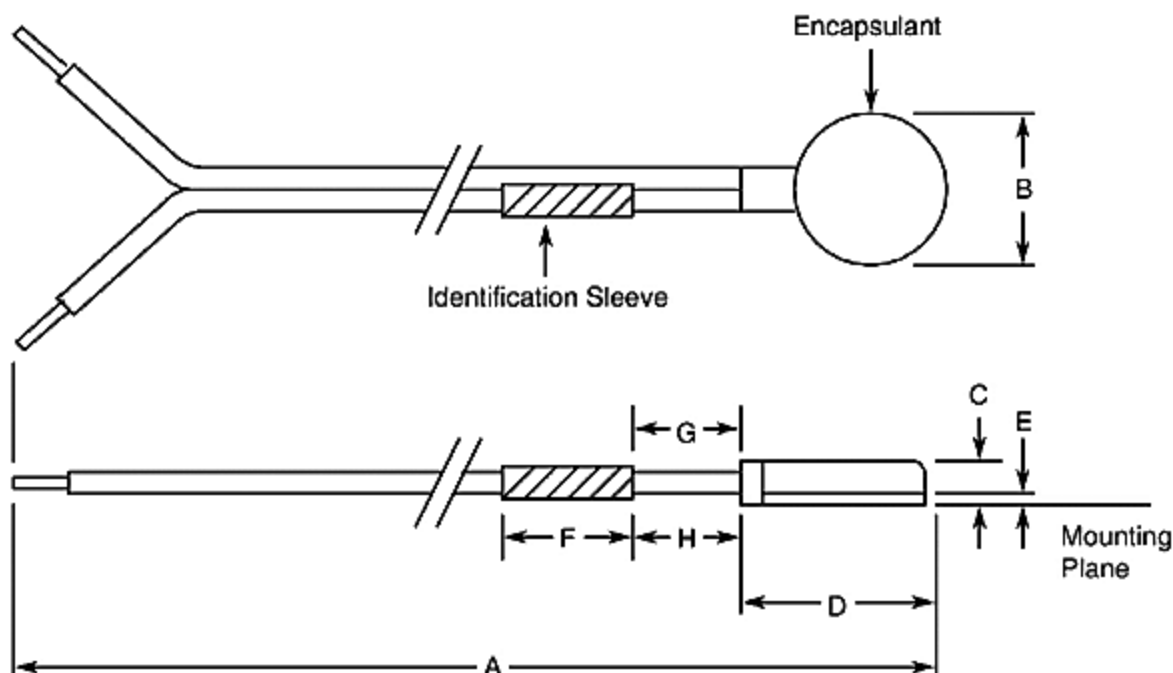
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Power Dissipation	P_D	2	mW	Note 1
Operating Temperature Range	T_{op}	Note 2	°C	
Storage Temperature Range Variants 08, 09, 13, 14: Variants 10, 11, 12:	T_{stg}	-60°C to T_{opmax} -40°C to T_{opmax}	°C	Note 3
Soldering Temperature	T_{sol}	+245	°C	Note 4

NOTES:

1. Never to be exceeded in the temperature measurement mode. The thermistors specified herein shall not be used in the self-heat mode.
2. The minimum and maximum Operating Temperatures are indicated for each Variant by the Resistance/Temperature Characteristics specified in Para. 1.4.2.
3. For the maximum Operating Temperature, T_{opmax} , see Note 2.
4. Duration 10 seconds maximum, not within dimension H specified in Para. 1.6, and the same lead shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS

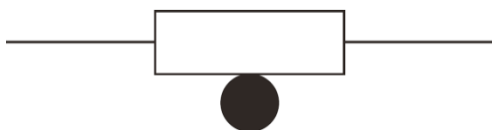


Symbols	Dimensions (mm)						Notes
	Variants 08, 13		Variants 09, 14		Variants 10, 11, 12		
	Min	Max	Min	Max	Min	Max	
A	356	406	500	550	280	330	
B	6.1	6.6	6.1	6.6	6.1	6.6	
C	-	2.4	-	2.8	-	2.8	
D	-	9.8	-	9.8	-	9.8	1
E	0.33	0.48	0.33	0.48	0.33	0.48	
F	-	50	-	50	-	50	
G	50	80	50	80	50	80	2
H	50	-	50	-	50	-	3

NOTES:

1. Within this dimension (housing and crimp section) no part of the housing, or leads, shall protrude below the mounting plane by more than 0.13mm.
2. Location of the identification sleeve.
3. Leads shall not be stripped or cut within dimension H.

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Body

Aluminium, filled with a black epoxy encapsulant.

1.8.2 Lead Material

The lead material shall be as specified in Para. 1.4.2. One lead shall carry an identification sleeve which shall bear the part marking specified herein (see Para. 1.6).

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 *Deviations from Qualification and Periodic Tests - Chart F4*

- (a) Dissipation Constant: Not Applicable.
- (b) Short Time Load: Not Applicable.
- (c) High Temperature Storage: Not Applicable.

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#) and as follows.

The information to be marked on the component shall be:

- (a) The ESCC Qualified Component Symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Para. 1.4.1)
- (c) Traceability information.

2.3 THERMAL SHOCK

Thermal Shock shall be performed as specified in the ESCC Generic Specification with Test Condition C. However, the maximum test temperature shall be the applicable maximum operating temperature specified in Para. 1.5.

2.4 TERMINAL STRENGTH

The test conditions for Terminal Strength, tested as specified in the ESCC Generic Specification, shall be as follows:

- Applied Force: 4.45 (+1.1 -0)N.
- Duration: 5 seconds.

2.5 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.5.1 Room Temperature Electrical Measurements

Unless otherwise specified, the measurements shall be performed at $T_{amb} = +25 \pm 0.01^{\circ}\text{C}$.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Zero Power Resistance	R_z	ESCC No. 4006	Note 1		Ω
Insulation Resistance	R_i	ESCC No. 4006 $T_{amb} = +25 \pm 1^{\circ}\text{C}$ Note 2	100	-	$\text{M}\Omega$
Thermal Time Constant	KH	ESCC No. 4006 $T_{amb} = +25 \pm 1^{\circ}\text{C}$ In Still Air Note 3			s
Variants 08, 13:			-	25	
Variants 09, 10, 11, 12, 14:			-	40	

NOTES:

- See Para. 1.4.2 for resistance values and tolerances.
- The measurements shall be performed on a sample of 5 components with 0 failures permitted. In the event of any failure a 100% inspection may be performed.
- Test to be performed on 10 samples and only during Chart F2 Production Control Tests.

2.5.2 High and Low Temperatures Electrical Measurements

The measurements shall be performed at each applicable temperature (with a tolerance of $\pm 0.01^{\circ}\text{C}$) specified in Para. 1.4.2.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Zero Power Resistance	R_z	ESCC No. 4006	Note 1		Ω

NOTES:

- See Para. 1.4.2 for resistance values and tolerances.

2.6 PARAMETER DRIFT VALUES

Unless otherwise specified, the measurements shall be performed at $T_{amb} = +25 \pm 0.01^\circ\text{C}$.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1 Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Limits			Units
		Drift Value (Δ)	Absolute		
			Min	Max	
Zero Power Resistance	R _Z	±0.2%	Note 1		Ω

NOTES:

- See Para. 1.4.2 for resistance values and tolerances.

2.7 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at $T_{amb} = +25 \pm 0.01^\circ\text{C}$.

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.5.1 Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded

Test Reference per ESCC No. 4006	Characteristics	Symbols	Limits		Units
			Min	Max	
Thermal Time Constant	<u>Initial Measurements</u>				
	Zero Power Resistance	R_z	Note 1		Ω
	<u>Final Measurements</u>				
	Thermal Time Constant:	KH			s
	Variants 08, 13:		-	25	
	Variants 09, 10, 11, 12, 14:		-	40	
Shock (Specified Pulse)	<u>Initial Measurements</u>				
	Zero Power Resistance	R_z	Note 1		Ω
	<u>After Shock</u>				
	Zero Power Resistance Change	$\Delta R_z/R_z$	± 2		%
Vibration	<u>Initial Measurements</u>				
	Zero Power Resistance	R_z	Note 1		Ω
	<u>After Vibration</u>				
	Zero Power Resistance Change	$\Delta R_z/R_z$	± 2		%
Resistance to Soldering Heat	<u>Final Measurements</u>				
	Zero Power Resistance	R_z	Note 1		Ω

Test Reference per ESCC No. 4006	Characteristics	Symbols	Limits		Units
			Min	Max	
Moisture Resistance	<u>Initial Measurements</u>		Note 1		Ω
	Zero Power Resistance	R_z			
	<u>Final Measurements</u>		± 2		%
	Zero Power Resistance Change	$\Delta R_z/R_z$			
Terminal Strength	<u>Initial Measurements</u>		Note 1		Ω
	Zero Power Resistance	R_z			
	<u>Final Measurements</u>		± 2		%
	Zero Power Resistance Change	$\Delta R_z/R_z$			
Operating Life	<u>Initial Measurements</u>		Note 1		Ω
	Zero Power Resistance	R_z			
	<u>At 1000 ± 48 hours</u>		± 1		%
	Zero Power Resistance Change	$\Delta R_z/R_z$			
	<u>Insulation Resistance</u>		100 -		$M\Omega$
	At 2000 ± 48 hours	R_i			
	<u>Zero Power Resistance Change</u>		± 1		%
	Insulation Resistance	$\Delta R_z/R_z$			
Low Temperature Storage	<u>Initial Measurements</u>		Note 1		Ω
	Zero Power Resistance	R_z			
	<u>Final Measurements</u>		± 2		%
	Zero Power Resistance Change	$\Delta R_z/R_z$			

NOTES:

- See Para. 1.4.2 for resistance values and tolerances.

2.8 BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	Note 1	$^{\circ}C$
Power Dissipation	P_D	2	mW

NOTES

- Maximum Operating Temperature specified in Para. 1.5 (+0 -3) $^{\circ}C$.

2.9 OPERATING LIFE CONDITIONS

The conditions shall be as specified in Para. 2.8.

APPENDIX A

AGREED DEVIATIONS FOR TE CONNECTIVITY MEAS (BETATHERM) (IRL)

Items Affected	Description of Deviations
Para. 2.1.1 Deviations from the Generic Specification: Production Control – Chart F2	<p>Thermal Shock: Parameter Drift Value measurements shall be performed immediately before and after Thermal Shock (ref. Para. 2.6 of the Detail Specification).</p> <p>Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with Manufacturer's specification Ref. MFG 12-49-00.</p> <p>All Parameter Limit Failures and Parameter Drift Failures during Room Temperature Electrical Measurements performed after Thermal Shock shall be included in the Check for Lot Failure calculation (i.e. Percent Defective Allowable, PDA) of Chart F3 of the Generic Specification. This percent defective shall be referenced against the quantity of components submitted to Screening Tests plus any Parameter Limit Failures and Parameter Drift Failures during Room Temperature Electrical Measurements performed after Thermal Shock.</p>
Para. 2.1.1 Deviations from the Generic Specification: Screening Tests – Chart F3 Para. 2.8 Burn-In Conditions	<p>Burn-in: Burn-in shall be performed without application of power, therefore the Power Dissipation (P_D) condition shall be 0W.</p> <p>Note: For Para. 2.9 Operating Life, the test conditions shall be as specified in Para. 2.8 (i.e. with $P_D = 2mW$).</p>
Para. 2.1.1 Deviations from the Generic Specification: Screening Tests – Chart F3	<p>Room Temperature Electrical Measurements: Insulation Resistance may be measured in accordance with Manufacturer's specification Ref. MFG 12-49-00.</p> <p>Radiographic Inspection: Inspection shall be a single view such that the component's mounting plane is seated on the X-ray film holder.</p> <p>Check For Lot Failure: See deviation to Chart F2 Room Temperature Electrical Measurements above.</p>
Para. 2.1.1.1 Deviations from Qualification and Periodic Tests - Chart F4	<p>Intermediate and End-Point Electrical Measurements: Insulation Resistance may be measured in accordance with Manufacturer's specification Ref. MFG 12-49-00.</p>

ADDITIONAL DATA - TE CONNECTIVITY MEAS (BETATHERM) (IRL)

(a) Maximum Ratings

Application of any power level above the specified $P_D = 2mW$ maximum rating (see Para. 1.5) is classed as destructive. Nevertheless, these components are able to tolerate applied power levels in the order of up to 200mW.

For an intended application that requires accurate assessment of the component's tolerance to excessive power levels, evaluation testing should be performed under conditions that closely simulate the thermal environment of the application.